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EXAMINER	
MOORE, KARLA A	
ART UNIT	PAPER NUMBER
1763	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/07/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	09/982,954	SANDHU ET AL.	
	Examiner	Art Unit	
	Karla Moore	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,7-10 and 46-52* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,7-10 and 46-52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 October 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *1106*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 7-8, 10 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,670 to Kelly in view of U.S. Patent No. 5,935,334 to Fong et al. and U.S. Patent No. 5,667,592 to Boitnott et al.

3. Kelly discloses an apparatus *capable* of atomic layer deposition, comprising: a plurality of deposition regions (Figure 1, e1 and e2), each of said regions comprising at least one gas exhaust port (24 and 26), **wherein each of said plurality of regions are chemically isolated from one another by vertical inert gas curtains (column 2, rows 64-66 and column 4, rows 41-45)**, and wherein each of said processes are different from one another; and a central loading robot assembly (104) for moving a first substrate laterally through at least one of said vertical inert gas curtains.

4. Examiner notes that although the gas curtains are not explicitly disclosed as vertical, they must be in order to effectively isolate the regions. One of ordinary skill in the art would recognize this.

5. However, Kelly fail to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

6. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

7. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in King in order to diffuse the dopant atoms as taught by Fong et al.

8. Kelly and Fong et al. disclose the invention substantially as claimed and as described above.

4. However, Kelly and Fong et al. fail to teach first and second susceptors in each of the reactor chambers and a loading assembly capable of moving a substrate back and forth between the reactor chambers.

5. Boitnott et al. disclose a multistation processing apparatus comprising separate susceptors (Figure 6, 316) in each station and a loading assembly (Figures 1-2 and 5, 30) capable of moving a substrate back and forth between the stations for the purpose of reducing the amount of contamination that can exchange between processing stations while moving a queue of wafers through the system (column 4, rows 22-31).

6. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a multistation processing apparatus comprising separate susceptors in each station and a loading assembly capable of moving the a substrate back and forth between the stations in Kelly and Fong et al. in order to reduce the amount of contamination that can exchange between processing stations while moving a queue of wafers through the system as taught by Boitnott et al.

9. With respect to claims 7-8 and 10, similar to the claimed invention, the central loading robot assembly is capable of moving a plurality of substrates laterally through four regions sequentially or in a predefined pattern (see Figures 4A and 4B). Thus, a plurality of substrates can be treated simultaneously in respective pairs of first and second regions and then transferred to another plurality of regions. With respect to each of the regions containing a different processing gas, they are capable as taught at column 7, rows 22-25.

10. With respect to claim 49, each of said regions are separate reaction chambers and wherein the reaction chambers are separated by the vertical inert gas curtains.

11. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kelly, Fong et al. and Boitnott et al. as applied to claims 1, 7-8, 10 and 49 above, and further in view of U.S. Patent No. 6,207,005 B1 to Henley et al.

12. Kelly, Fong et al. and Boitnott et al. disclose the invention substantially as claimed and as described above.

13. However, Kelly, Fong et al. and Boitnott et al. fail to teach an apparatus comprising a third pair of atomic layer doping regions.

14. Henley et al. disclose a deposition apparatus comprising 3 pairs of deposition regions (Figure 1) where increased through put is the result.

15. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an additional pair of deposition regions in Kelly, Fong et al. and Boitnott et al. in order to increase the throughput of the deposition apparatus as taught by Henley et al.

16. Claims 46 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,670 to Kelly in view of U.S. Patent No. 5,935,334 to Fong et al., European Patent Application No. 0 060626 to Gattuso et al. and U.S. Patent No. 5,667,592 to Boitnott et al.

17. Kelly discloses an apparatus *capable* of atomic layer deposition, comprising: a plurality of deposition regions (Figure 1, e1 and e2), each of said regions comprising at least one gas exhaust port (24 and 26), wherein each of said plurality of regions are chemically isolated from one another by vertical inert gas curtains (column 2, rows 64-66 and column 4, rows 41-45), and wherein each of said processes are different from one another; and a central loading robot assembly (104) for moving a first substrate laterally through at least one of said vertical inert gas curtains.

18. Examiner notes that although the gas curtains are not explicitly disclosed as vertical, they must be in order to effectively isolate the regions. One of ordinary skill in the art would recognize this.

19. However, Kelly fails to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

20. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

21. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in Kelly in order to diffuse the dopant atoms as taught by Fong et al.

22. Kelly and Fong et al. disclose the invention substantially as claimed and as described above.

23. However, Kelly and Fong et al. to teach an inert gas curtain provided at a higher pressure than said first dopant species.

24. Gattuso et al. teach the use of an inert gas curtain provided at a pressure somewhat higher than that of the reaction gases within the chamber to create an effective, non-reactive gas curtain (abstract).

25. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an inert gas curtain at a higher pressure than the reaction gases in Kelly and Fong et al. in order to create an effective and non-reactive gas curtain as taught by Gattuso et al.

26. Kelly and Fong et al. and Gattuso et al. disclose the invention substantially as claimed and as described above.

27. However, Kelly and Fong et al. and Gattuso et al. fail to teach first and second susceptors in each of the reactor chambers and a loading assembly capable of moving a substrate back and forth between the reactor chambers.

28. Boitnott et al. disclose a multistation processing apparatus comprising separate susceptors (Figure 6, 316) in each station and a loading assembly (Figures 1-2 and 5, 30) capable of moving a substrate back and forth between the stations for the purpose of reducing the amount of contamination that can exchange between processing stations while moving a queue of wafers through the system (column 4, rows 22-31).

29. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a multistation processing apparatus comprising separate susceptors in each station and a loading assembly capable of moving the a substrate back and forth between the stations in Kelly and Fong et al. and Gattuso et al. in order to reduce the amount of contamination that can exchange

between processing stations while moving a queue of wafers through the system as taught by Boitnott et al.

30. With respect to claim 50, each of said regions are separate reaction chambers and wherein the reaction chambers are separated by the vertical inert gas curtains.

31. Claims 47 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,071,670 to Kelly in view of U.S. Patent No. 5,935,334 to Fong et al. further in view of U.S. Patent No. 5,382,126 to Hartig et al. and U.S. Patent No. 5,667,592 to Boitnott et al.

32. Kelly discloses an apparatus *capable* of atomic layer deposition, comprising: a plurality of deposition regions (Figure 1, e1 and e2), each of said regions comprising at least one gas exhaust port (24 and 26), wherein each of said plurality of regions are chemically isolated from one another by vertical inert gas curtains (column 2, rows 64-66 and column 4, rows 41-45), and wherein each of said processes are different from one another; and a central loading robot assembly (104) for moving a first substrate laterally through at least one of said vertical inert gas curtains.

33. Examiner notes that although the gas curtains are not explicitly disclosed as vertical, they must be in order to effectively isolate the regions. One of ordinary skill in the art would recognize this.

34. However, Kelly fails to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

35. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

36. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in Kelly in order to diffuse the dopant atoms as taught by Fong et al.

37. Examiner realizes that the prior art fails to explicitly teach the use of a non-reactive gas in a second region. However, this is seen as an intended use of which the prior art would be capable. The courts have ruled that expressions relating the apparatus to the contents thereof during an intended

operation are of no significance in determining the patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969).

38. Kelly and Fong et al. disclose the invention substantially as claimed and as described above.

39. However, Kelly and Fong et al. fail to teach a separate gas exhaust for each region in a multi-chamber coating apparatus.

40. Hartig et al. teach the use of separate gas exhausts in each chamber for the purpose of aspirating gas from each chamber and further preventing gas transfer between the individual chambers (column 2, rows 17-22).

41. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided separate exhaust mechanisms in each chamber in Kelly and Fong et al. in order to aspirate each chamber and further prevent gas transfer between the individual chambers as taught by Hartig et al.

42. Kelly and Fong et al. and Hartig et al. disclose the invention substantially as claimed and as described above.

43. However, Kelly and Fong et al. and Hartig et al. fail to teach first and second susceptors in each of the reactor chambers and a loading assembly capable of moving a substrate back and forth between the reactor chambers.

44. Boitnott et al. disclose a multistation processing apparatus comprising separate susceptors (Figure 6, 316) in each station and a loading assembly (Figures 1-2 and 5, 30) capable of moving a substrate back and forth between the stations for the purpose of reducing the amount of contamination that can exchange between processing stations while moving a queue of wafers through the system (column 4, rows 22-31).

45. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a multistation processing apparatus comprising separate susceptors in each station and a loading assembly capable of moving the a substrate back and forth between the stations in Kelly and Fong et al. and Hartig et al. in order to reduce the amount of contamination that can exchange

between processing stations while moving a queue of wafers through the system as taught by Boitnott et al.

46. With respect to claim 51, each of said regions are separate reaction chambers and wherein the reaction chambers are separated by the vertical inert gas curtains.

47. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,314,538 to Maeda et al. in view of U.S. Patent No. 5,935,334 to Fong et al. and U.S. Patent No. 5,667,592 to Boitnott et al.

48. Maeda et al. disclose a deposition apparatus *capable* of atomic layer deposition, substantially as claimed and comprising, a first deposition region (Figure 2, at "b") for depositing a first gas species on a first substrate as a monolayer, wherein the first deposition region has a first reactive gas supply inlet (38b) located at a first upper position and a first exhaust outlet (40b) connected to a first exhaust system (45b) situated at an opposite position from said first reactive gas supply inlet; a second deposition region (at "c"; also see column 7, rows 20-24) for depositing a second gas species on said first substrate as a monolayer, **said first and second deposition regions being chemically isolated from one another by a physical barrier having a closeable opening (not shown; column 4, rows 54-57) located between adjacent sidewalls of said first and second deposition regions**, wherein the second deposition region has a second reactive gas supply inlet; and a central loading robot assembly (multiple part numbers; 33 and 34 a-f) for moving said first substrate from said first deposition region to said second deposition region through said closeable opening of said physical barrier. Although not explicitly disclosed, the physical barriers would obviously be oriented vertically in order perform their necessary function of isolation between regions.

49. However, Maeda et al. fail to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

50. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

51. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in Maeda et al. in order to diffuse the dopant atoms as taught by Fong et al.

52. Maeda et al. and Fong et al. disclose the invention substantially as claimed and as described above.

53. However, Maeda et al. and Fong et al. fail to teach first and second susceptors in each of the reactor chambers and a loading assembly capable of moving a substrate back and forth between the reactor chambers.

54. Boitnott et al. disclose a multistation processing apparatus comprising separate susceptors (Figure 6, 316) in each station and a loading assembly (Figures 1-2 and 5, 30) capable of moving a substrate back and forth between the stations for the purpose of reducing the amount of contamination that can exchange between processing stations while moving a queue of wafers through the system (column 4, rows 22-31).

55. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a multistation processing apparatus comprising separate susceptors in each station and a loading assembly capable of moving the a substrate back and forth between the stations in Maeda et al. and Fong et al. in order to reduce the amount of contamination that can exchange between processing stations while moving a queue of wafers through the system as taught by Boitnott et al.

56. Claim 52 is rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda et al. and Fong et al. and Boitnott et al. as applied to claim 48 above, and further in view of U.S. Patent No. 5,071,670 to Kelly.

57. Maeda et al. and Fong et al. and Boitnott et al. disclose the invention substantially as claimed and as described above.

58. However. Maeda et al. and Fong et al. and Boitnott et al. fail to teach the reaction regions separated by an inert gas curtain.

59. Kelly discloses an apparatus *capable* of atomic layer deposition, comprising: a plurality of deposition chambers (Figure 1, e1 and e2), each of said regions comprising at least one gas exhaust port (24 and 26), wherein each of said plurality of regions are chemically isolated from one another by vertical inert gas curtains (column 2, rows 64-66 and column 4, rows 41-45) for the purpose of keeping to adjacent processing environments separate.

60. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a vertical inert gas curtain between the processing regions in Maeda et al. and Fong et al. and Boitnott et al. in order to provide adjacent and separate processing chambers taught by Kelly.

Response to Arguments

61. Other pending claims: Applicant's arguments filed 22 November 2006 have been fully considered but they are not persuasive.

62. Kelly discloses vertical inert gas curtains (i.e. chemical barriers, per Applicant's specification) between processing regions, as described above and in the previous office action.

63. Maeda et al. discloses a first region capable of deposition and a second region capable of doping, as described above and in the previous office action.

64. Applicant's arguments with respect to the construction of the central loading robot and first and second substrate holders have been considered but are moot in view of the new ground(s) of rejection. Boitnott et al. teaches the newly added limitation of first and second substrate holders and a central robot assembly for moving a substrate back and forth between the first and second substrate holders.

Conclusion

65. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karla Moore whose telephone number is 571.272.1440. The examiner can normally be reached on Monday-Friday, 9:00 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571.272.1435. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Karla Moore
Primary Examiner